CLAIMS

What we claim is:

1. A high capacity and high power density primary or secondary electrochemical generator having two electrodes supporting different electroactive materials, said electrodes being connected together by an electrolyte, characterized in that the electroactive material used in the composition of at least one electrode includes an oxide or chalcogenide of transition metals or their lithiated or partially lithiated forms selected from TiO_2, Nb_2O_5, WO_3, V_2O_5, MoO_3, MnO_2, $Li_xMn_2O_4$, HfO_2, TiS_2, WS_2, $TiSe_2$, Li_xNiO_2, Li_xCoO_2, $Li_x(NiCo)O_2$, Fe_2O_3, Fe_3O_4, RuO_x, Fe_xS_2, Ru_xS_2, MoS_2, WS_2, Ir_xO_2, Ce_xO_2, $Li_xNa_yMnO_zI_n$ (n<1), In_xO_3, Ta_xO_5, SnM_xO_y, where M is one of glass forming metallic elements or a mixture of these elements, or Sn_xO_2 in mesoporous form having a pore size of 0.001 to 10 µm (micron) and a specific surface area between 2 and 2000 m^2/g.

2. An electrochemical generator according to claim 1 characterized in that the mesoporous electrode is characterized by a three dimensional bicontinuous structure consisting of an interconnected solid phase material used for reversible ion intercalation and for electronic transport which is in contact with an interconnected porous space filled with electrolyte the latter serving for ionic transport, said electrode being characterized by a morphology of the solid phase that is designed to overcome impediment of ionic diffusion in the electrolyte encountered with conventional high surface area electrodes and a three dimensional structure ascertaining interconnectivity, mechanical stability of the solid phase as well as access of the electrolyte to the entire pore space.

3. An electrochemical generator according to claim 1 ~~or 2~~ characterized in that the mesoporous electrically active material is prepared by precipitating a precursor compound of said material in aqueous solution via a sol-gel method followed by deposition of the precursor on a

conductive support and sintering at a temperature between 300 and 800 °C.

4. An electrochemical generator according to ~~any of~~ claim~~s~~ 1 ~~to 3~~ characterized in that the mesoporous electrically active material is prepared by chemical reaction between precursor compounds in aqueous solution in the presence of surfactant micelles, the said surfactant micelles acting as templates to produce the desired mesoporous morphology, particularly in the form of ordered hexagonal arrays.

5. An electrochemical generator according to ~~any of~~ claim~~s~~ 1 ~~to 4~~ characterized in that the electrically active material is composed of elongated interconnected members, that are connected to other elongated members in at least two points of an aspect ratio of at least 4 and of which the small dimension of the member is smaller than 300 nm.

6. An electrochemical generator according to ~~any of~~ claim~~s~~ 1 ~~to 5~~ characterized in that the electrically active material is prepared by inclusion of solvents to the particle or precursor in order to exert control over the texture and the morphology of the said material and of the porosity of the electrode, which can be controlled from 70% to 25% by changing the ratio of oxide precursor grains versus solvent.

7. An electrochemical generator according to ~~any of~~ claim~~s~~ 1 ~~to 6~~ characterized in that the mesoporous electrically active material is comprised of mesoporous 5-20 μm (micron) beads or rods which are electrically connected together by compressing in the form of pellets of films a mixture composed of said beads or rods, of carbon powder or conducting polymer or other matrix and of a bonding material contained in solvent, then drying said mixture on a conducting support and/or baking at temperature and long enough time for binder or conductive matrix conversion to desired state.

8. An electrochemical generator according to ~~any of~~ claim~~s~~ 1 ~~to~~ 8 characterized in that the electrolyte contains alkali or alkaline earth metals in cationic form.

9. An electrochemical generator according to any of claims 1 to 5 or 7 to 8 and claim 6 characterized in that the alkali metal is lithium on the form of one of its salts chosen from tetrafluoroborate, hexafluorophosphate, hexafluoroantimonate, hexafluoroarsenate, trifluoromethane sulfonate, bis-(trifluorosulfonyl) imide, tris-(trifluorosulfonyl)methide, trifluoro-methanesulfonate, trifluoroacetate, tetrachloroaluminate or perfluorobutane sulfonate.

10. An electrochemical generator according to any of claims 1 to 9, characterized in that the electrolyte includes and aprotic solvent selected from ethlyene carbonate, propylene carbonate, dimethylcarbonate, diethylcarbonate, dioxolane, butyrolactone, methoxypropionitrile, methoxy-ethoxy propionitrile, methoxy-diethoxypropionitrile, methoxyacetonitrile, tetrafluoro-propanol or mixtures of these solvents.

11. An electrochemical generator according to any of claims 1 to 10 characterized in that the electrolyte includes a molten salt as a solvent for the lithium ion containing salt, such as methyl-ethyl-imidazolium trifluoromethansulfonate, methy-ethyl-imidazolium bis (trifluorosulfonyl) imide or alkylguanidinium bis (trifluorosulfonyl) imide.

12. An electrochemical generator according to any of claims 1 to 11, characterized in that the electrically active material of one electrode or of each of the two electrodes, is capable of forming an intercalation compound with the alkali or alkaline earth metal.

13. An electrochemical generator according to any of claims 1 to 12, characterized in that the electrically active material of one electrode is composed of TiO_2 in anatase form having a mesoporous structure.

14. An electrochemical generator according to any of claims 1 to 13, characterized in that the negative electrode includes mesoporous TiO_2 and the composition of the positive electrode includes $Li_yMn_2O_4$ (y <2) in amorphous or crystalline form, the electrolyte being composed of a 1M solution of lithium bis-(trifluorosulfonyl) imide in methoxypropionitrile as a solvent.

15. An electrochemical generator according to any of claims 1 to 14, characterized in that the mesoporous electrically active material comprised of mesoporous 5-20 µm (micron) beads or rods form an electrode by templated ordering, manipulative stacking or arrangement of the said 5-20 µm (micron) secondary mesoporous particles in a manner that controls particle orientation, the secondary porosity and the said particle electrical contact by means of an additive conducting matrix or by treatment (chemical, temperature, external energy field such as ultrasonic, electromagnetic) of the conducting additive or its precursor or of the template itself in order to form the conductive phase.

16. An electrochemical generator according to any of claims 1 to 12 or 14 to 15, and claim 13, characterized in that separator (3) is a porous or mesoporous, high porosity insulating material such as ceramic (zirconia, alumina) or glass or polypropylene, the above in the forms of continuous layers or particle spacers and the current collector-substrate (4,5) is taken from options such as carbon, graphite paper, stainless steel, titanium or aluminium alloy, DSA, or consist of the conductive matrix incorporated for conductivity enhancement. Also, characterized in that a distributed within the active mass or dendritic conductive collector of the above is used.